

**Abstract of the Disclosure**

A method for producing a thin film includes disposing a precursor solution onto a substrate to form a precursor film. The precursor solution contains precursor components to a rare-earth/alkaline-earth-metal/transition-metal oxide including a salt of a rare earth element, a salt of an alkaline earth metal, and a salt of a transition metal in one or more solvents, wherein at least one of the salts is a fluoride-containing salt. The precursor solution also contains an additive component comprising one or more metal compounds capable of forming a second phase nanoparticle, either alone or in combination with one or more of the precursor components of the precursor solution or a dopant component comprising one or more metal compounds capable of substituting for an element of the rare-earth/alkaline-earth-metal/transition-metal oxide, and treating the precursor film to form an intermediate metal oxyfluoride including the rare earth, the alkaline earth metal, the transition metal and the additive metal or dopant metal of the precursor solution.

15